

## 2.4 Deductive Reasoning

Biconditional Statement--conjunction of a conditional and its converse

iff *if and only if*

Example:

~~If~~ a quadrilateral has 4 right angles, ~~then~~ it is a rectangle.  
If a quadrilateral is a rectangle, then it has 4 right angles

A quadrilateral has 4 right angles iff it is a rectangle.

Deductive Reasoning--use facts, rules, definitions, or properties to reach logical conclusions

Example:

If 2 angles are vertical, then they are congruent.

a. Given:  $\angle 1$  and  $\angle 2$  are vertical

Conclusion:  $\angle 1 \cong \angle 2$  *valid concl. b/c Given matches the hypothesis*

b. Given:  $\angle 3 \cong \angle 4$

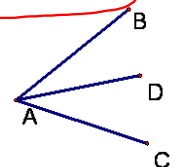
Conclusion: No valid concl.

Example:

If a ray bisects an angle, then it divides it into 2  $\cong$   $\angle$ s.

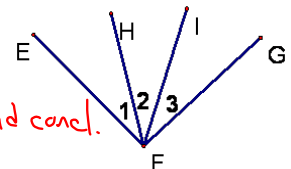
a. Given: AD bisects  $\angle BAC$

Conclusion:  $\angle BAD \cong \angle DAC$



b. Given:  $\angle 1 \cong \angle 3$

Conclusion: No valid concl.



Example:

If a figure is a rectangle, then opposite sides are congruent.

a. Given: ABCD is a rectangle  
Conclusion:  $\overline{AB} \cong \overline{DC}$   $\overline{BC} \cong \overline{AD}$



b. Given: MNOP is a valid trapezoid  
Conclusion: No valid concl.

c. Given: Figure RSTU;  $RS = TU$ ,  $ST = RU$   
Conclusion: No valid concl.



Examples of Law of Detachment

Law of Detachment--If  $p \rightarrow q$  is true, and  $p$  is true then  $q$  is true.

Translation: If  $p \rightarrow q$  is true, and you are given  $p$ , then the conclusion is  $q$ .

Different type of reasoning.

Example:

Given:  $\overline{WX} \cong \overline{UV}$ ;  $\overline{UV} \cong \overline{RT}$

Conclusion:

$$\overline{WX} \cong \overline{RT}$$

Example:

(1) If Casey gets to bat, then he will get a hit.

(2) If Casey gets a hit, then we will win the game.

(3) If Casey gets to bat, then we will win the game.

These are examples of the Law of Syllogism

If  $p \rightarrow q$ , and  $q \rightarrow r$  are true, then  $p \rightarrow r$  is true.

HW

p85-86 #s 12-29

p81 #1